Case Report:

**Rhabdomyolysis secondary to diarrhoea induced hypokalemia in a human immunodeficiency virus-seropositive patient**

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**ABSTRACT**

Hypokalemia with rhabdomyolysis caused by diarrhoea is uncommon in human immunodeficiency virus (HIV) infected patients. We report the case of a patient with HIV1 infection who presented with chronic diarrhoea that led to hypokalemia induced rhabdomyolysis and acute kidney injury (AKI). A 32-year-old man, known to be HIV-1 seropositive who was on treatment with tenofovir, lamivudine, lopinavir and ritonavir, presented to the emergency department with 6 months history of diarrhoea and sudden onset of weakness of all 4 limbs of two days duration. On examination limb power was grade 3/5 with hypotonia and diminished reflexes. Laboratory investigations showed severe hypokalemia, low urinary potassium, normal anion-gap metabolic acidosis, markedly increased creatine kinase and mildly increased serum creatinine. He was diagnosed as having diarrhoea induced hypokalemic myopathy leading to rhabdomyolysis and AKI. With potassium supplements, antiprotozoal treatment and adequate hydration he improved significantly and is on regular follow-up. Patients presenting with hypokalemia should be closely monitored for rhabdomyolysis, because outcome is good with early treatment.

**Key words:** HIV, Diarrhoea, Hypokalemia, Rhabdomyolysis

**INTRODUCTION**

Rhabdomyolysis refers to the disintegration of striated muscle resulting in release and circulation of muscle cell constituents into the extracellular fluid. When hypokalemia develops rapidly and becomes severe, muscle injury and rhabdomyolysis may occur. Hypokalemia induced rhabdomyolysis is a rare condition that can be caused by gastrointestinal or renal loss of potassium or due to drugs like diuretics, laxatives, among others. There are few reports in literature about chronic diarrhoea leading to secondary rhabdomyolysis in a human immunodeficiency virus (HIV) -seropositive patient and we report one such case.

**CASE REPORT**

A 32-year-old male patient with HIV1 Infection from 2001 who was non-compliant with antiretroviral treatment (ART), came to our institute with chief complaints of chronic intermittent diarrhoea of 6 months duration, sudden onset progressive weakness of lower limbs of 2 days duration in the form of inability to hold objects, get up from squatting position and walk without support. There was no history of fever, trauma, vomiting or backache prior to the illness. There was no history of sensory symptoms, cranial nerve involvement, and bladder or bowel incontinence. He was receiving antiretroviral treatment with ritonavir/lopinavir, tenofovir and lamivudine.

Received: 11 February 2014; Revised manuscript: 10 July 2014; Accepted: 18 July 2014.

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**Online access**


**DOI:** http://dx.doi.org/10.15380/2277-5706.JCSR.14.006

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from last one-and-half year. At admission his vital parameters were stable. Neurological examination showed hypotonia with diminished deep tendon reflexes and decreased power (3/5) in all limbs, more pronounced in lower limbs. Rest of the neurological examination, including sensory system examination was normal. Other systems examination was also normal.

The differential diagnosis we considered initially were (i) weakness secondary to hypokalaemia (as he had history of diarrhoea); (ii) HIV-associated neuropathy in the back ground of longer duration of HIV infection which usually manifests with paresthesias and pain in the extremities and (iii) possibility of acute inflammatory demyelinating polyneuropathy was also considered in view of weakness of limbs and associated hypotonia and its higher incidence in HIV-infected patients. Laboratory investigations showed cluster differentiation (CD4+) T-lymphocyte count of 191 cells/mm$^3$, haemoglobin 13.3 g/dL, total leucocyte count 4,500/mm$^3$, platelet count 3.2 lakhs/mm$^3$. Serum alkaline phosphatase was normal. There was a mild elevation in hepatics transaminases [aspartate aminotransferase (AST) 198 IU/L, alanine aminotransferase (ALT) 65 IU/L].

Other investigations included total proteins 6.9 g/dL and albumin 3g/dL; blood urea 18mg/dL; serum creatinine 0.6 mg/dL and serum electrolytes showed sodium 133meq/L, potassium 1.5 meq/L, calcium 8.6 meq/L, phosphorous 3.5 meq/L, magnesium 2.1 mg/dL, and bicarbonate 14meq/L. Urine microscopy was normal. Spot urine examination showed a low potassium of 9 meq/L (normal 6-20 meq/L) which is near the lower normal limit. Arterial blood gas analysis showed normal anion-gap metabolic acidosis. Stool culture had grown normal flora and no evidence of cysts or ova of parasites. Electrocardiogram (ECG) showed broad flat T waves and QT prolongation QT$C$ interval 0.49 second (Figure 1).

Nerve conduction studies showed significant reduction in compound muscle action potential (CMAP) amplitudes of all motor nerves with normal sensory nerve action potential (SNAP) amplitudes, distal latencies, conduction

**Figure 1:** Electrocardiogram showing QT - prolongation and broad flat T - waves
with parenteral potassium 120 meq/day in normal saline and oral potassium (potklor syrup) 20 meq 6 hourly for 5 days. Two days after admission his power of limbs and reflexes improved, but he complained pain and spasm in both lower limbs. Deep vein thrombosis was ruled out. Rhabdomyolysis was suspected; serum creatine kinase (CK) was 9323 IU/L (normal 20-200 IU/L); creatine kinase muscle brain (CK-MB) fraction was normal. As there was no evidence of renal loss of potassium, and no history of diuretic or laxative usage, hypokalaemia was considered to be due to diarrhoea and it was concluded rhabdomyolysis was due to hypokalaemia. He was continued treatment with intravenous fluids along with potassium supplementation and adequate urine output was maintained. Antiretroviral therapy was continued with ritonavir/lopinavir, tenofovir and lamivudine. During hospital stay, his serum creatinine had risen from 0.6 mg/ dL to 1.4 mg/dL in 48 hours. Liver function tests, serum creatinine, potassium and creatine kinase values during the hospital course are shown in Table 1. General condition of the patient improved and diarrhoea responded to nitazoxanide treatment. The patient is on regular follow-up in the out patient department and is doing well at 6 months follow up.

**DISCUSSION**

Chronic diarrhoea is a common gastrointestinal manifestation in patients with acquired immune deficiency syndrome (AIDS). This is commonly caused by opportunistic infections commonly, parasitic infections but can also be

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Day 1</th>
<th>Day 3</th>
<th>Day 6</th>
<th>Day of discharge</th>
<th>At 2 weeks follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum potassium (meq/L)</td>
<td>1.5</td>
<td>2.4</td>
<td>3.2</td>
<td>4</td>
<td>4.4</td>
</tr>
<tr>
<td>Creatine kinase (IU/L)</td>
<td>ND</td>
<td>9323</td>
<td>3990</td>
<td>1560</td>
<td>80</td>
</tr>
<tr>
<td>Serum creatinine (mg/dL)</td>
<td>0.6</td>
<td>1.4</td>
<td>0.8</td>
<td>0.6</td>
<td>1.0</td>
</tr>
<tr>
<td>AST (IU/L)</td>
<td>68</td>
<td>198</td>
<td>134</td>
<td>106</td>
<td>35</td>
</tr>
<tr>
<td>ALT (IU/L)</td>
<td>65</td>
<td>112</td>
<td>124</td>
<td>74</td>
<td>20</td>
</tr>
</tbody>
</table>

AST = aspartate aminotransferase; ALT = alanine aminotransferase ND = not done
caused by the HIV infection itself.\(^3\)
Hypokalemia is one of the complication due to chronic diarrhoea which can lead to various complications like arrhythmias, glucose intolerance, muscular weakness, rhabdomyolysis and paralysis.\(^4\)

Hypokalemia is responsible for 14%-28% for the total cases of rhabdomyolysis. However, often hypokalemia is not recognized as the cause of rhabdomyolysis due to the compensatory increase in serum potassium levels caused by rhabdomyolysis itself.\(^4\)

The proposed mechanism is that, normally, during exercise, muscles release intracellular potassium causing local rise in potassium which causes vasodilation and increases perfusion to the active muscle cells. Hypokalemia decrease local hyperkalemia preventing the vasodilation which results in tissue hypoxia and rhabdomyolysis.\(^5\)

There are mainly three categories of patients with rhabdomyolysis: i) pure exercise-induced rhabdomyolysis; ii) patients with genetically acquired defects in adenosine triphosphate (ATP) generation; and iii) patients with one or more precipitating causes like infections, drugs or toxins e.g., cocaine, amphetamines, snake venom toxin (especially of sea snakes), injuries (direct and ischaemic) and situations with long-standing muscular contraction or rigor (status epilepticus, malignant hyperthermia) etc., leading to rhabdomyolysis.\(^4,6\)

In our patient rhabdomyolysis was possibly due to hypokalemia secondary to diarrhoea. Tenofovir induced hypokalemia was also considered in differential diagnosis, but it was ruled out as there was no evidence of proteinuria, renal dysfunction or other evidence of Fanconi syndrome.

Rhabdomyolysis is a syndrome characterized by skeletal muscle breakdown, myoglobinuria, and creatine phosphokinase (CPK) elevation and may commonly lead to renal dysfunction.\(^6\)

The most common symptoms of rhabdomyolysis are fatigue, weakness, muscular pain and swelling, tea-coloured urine, sometimes life-threatening disease process with multiple organ dysfunction syndrome disseminated intravascular coagulation (DIC) and cardiac arrest.\(^7\)

It is possible for some patients to remain asymptomatic.\(^7\) About 10%-50% of patients with rhabdomyolysis develop acute kidney injury (AKI) which accounts for 8% to 15% of total cases of AKI and associated with mortality rate of 5%.\(^1,7\)

Our patient had AKI as there was greater than two-fold rise in serum creatinine from baseline in 48 hours suggestive of stage II AKI.\(^8\) AKI improved by day 6 in our patient (Table 1).

A five-fold or greater increase in serum CK, the most sensitive enzyme marker of muscle injury without cardiac or brain injury is sufficient to diagnose rhabdomyolysis.\(^9\) The CK rises within 12 hours of muscle injury, peaks in 1-3 days, and declines 3-5 days after the cessation of muscle injury as seen in our patient. A peak CK level of 5000 U/L or greater is predictive of development of AKI. Myoglobin has a short half-life of 2-3 hours and returns to normal within 6-8 hours. Estimation of myoglobin in serum and urine is useful, only in the early phases of the disease.\(^7\) Hence, many workers do not recommend measurement of myoglobin for diagnosis of rhabdomyolysis.\(^7\)

In the present report rhabdomyolysis was diagnosed on the basis of serum CK levels and monitored by its serial measurement.

Rhabdomyolysis is a rare manifestation, and can occur at any stage of HIV infection and is usually multifactorial.\(^6\) Risk factors for rhabdomyolysis among the HIV positive patients include lower CD4+ T-cell count, use of lipid lowering drugs like statins, HIV ribonucleic acid (RNA) levels greater than 500 copies / mL, alcohol or drug use, black race, longer duration of HIV infection, acquisition
of HIV through male-to-male sexual contact.\textsuperscript{3} Our patient was at a high risk to develop rhabdomyolysis due to long duration of HIV infection and low CD4+ T-lymphocyte count. Despite the frequent occurrence of diarrhoeal disorders among patients with HIV/ AIDS, rhabdomyolysis secondary to diarrhoea induced hypokalemia is under reported. Therefore, it is important for clinicians to be aware of this association. Early diagnosis, along with aggressive treatment of complications, decreases the morbidity and mortality due to rhabdomyolysis. In conclusion, our case highlights that chronic diarrhoea with resultant hypokalemia should be included as one of the causes of rhabdomyolysis.

**ACKNOWLEDGEMENTS**

We acknowledge Dr Shanthiveer Uppin Associate Professor, Department of Pathology for help with expert opinion on the duodenal biopsy report of the patient.

**REFERENCES**


